

NEAR-NET-SHAPE POLYMERIZATION PROCESS AND MATERIALS SUITABLE FOR USE THEREWITH

5 CROSS REFERENCE TO RELATED APPLICATIONS

5-84
This application is a continuation-in-part application of U.S. application Serial No. 511,661, filed on February 22, 2000, ^{new US Patent 6,380,319} which is a continuation-in-part application of International patent application No. PCT/US99/22048, filed on September 22, 1999 and designating the United States, 10 which claims the benefit of U.S. Provisional Patent Application Serial No. 60/101,285, filed on September 22, 1998; the disclosures of all of which are incorporated herein by reference in their entirety.

15 FIELD OF THE INVENTION

This invention is related to the fields of polymerization and molding. More particularly, it is related to a process for the rapid in-situ near-net-shape polymerization of semi-solid-like materials to provide objects that are dimensionally stable and precise, with very little shrinkage upon curing. The invention is further related to semi-solid-like materials useful with the process.

20 BACKGROUND OF THE INVENTION

Dimensionally precise objects/articles find numerous applications in electronics, optics, automotive, aerospace, and other high-technology industries. Examples include optically transparent objects/articles such as various precision lenses (spherical and aspherical), ophthalmic lenses (single vision, bifocal, trifocal, and progressive), contact lenses, optical data storage disk substrates, and projection optics/lens arrays. Non-transparent but dimensionally exact parts 25 abound, such as couplers, housings, gears, and various packaging assemblies. The most straightforward fabrication method for dimensionally precise parts is the machining, grinding, and polishing of sheet stock and, in fact, this approach is still used today for some types of ophthalmic lenses. Unfortunately, this approach is limited to simple geometries and is costly due to the 30 relatively large amounts of skilled labor required to produce a single part. More commonly, the plastics industry relies on well-known processes such as injection molding, compression molding, transfer molding, reactive injection molding (RIM), and casting for the fabrication of geometrically complex parts.

Injection molding, compression molding and transfer molding require the use of 35 thermoplastic polymers. Material choices are limited to uncrosslinked polymers that can be melted